UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte CHRISTY MEI-CHU WOO,
ERIC N. PATON and SUSAN TOVER

Appeal No. 2004-0784
Application 09/826,078

ON BRIEF

Before WARREN, TIMM and JEFFREY T. SMITH, *Administrative Patent Judges.*

WARREN, *Administrative Patent Judge.*

Decision on Appeal and Opinion

We have carefully considered the record in this appeal under 35 U.S.C. § 134, including the opposing views of the examiner, in the answer, and appellants, in the brief and reply brief, and based on our review, find that we cannot sustain the grounds of rejection of appealed claims 4, 5, 7, 8 and 10 through 15, which appear from the official record to be all of the claims in the application:[1] claims 4, 5, 7, 10, 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over Gupta et al. (Gupta), admitted prior art at page 2, lines 17-25, of the specification (admitted prior art) and Wolf et al. (Wolf); claims 11 and 12 under 35 U.S.C. § 103(a) as being unpatentable over Gupta, admitted prior art and Wolf as applied to claim 8 above, further in view of Chen et al.

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[1] See the appendix to the brief.

(Chen); and claim 15 under 35 U.S.C. § 103(a) as being unpatentable over Gupta and Wolf as applied to claim 14 above, further in view of Chen Kunishima et al. (Kunishima).[2]

The respective positions advanced by the examiner and appellants are set forth in the examiner's answer and appellants' brief and reply brief, and will not be reiterated here in their entirety.

It is well settled that in order to establish a *prima facie* case of obviousness, the examiner must show that some objective teaching, suggestion or motivation in the applied prior art taken as a whole and/or knowledge generally available to one of ordinary skill in this art would have led that person to the claimed invention as a whole, including each and every limitation of the claim arrange as required by the claim, without recourse to the teachings in appellant's disclosure. *See generally, In re Rouffet*, 149 F.3d 1350, 1358, 47 USPQ2d 1453, 1458 (Fed. Cir. 1998); *Pro-Mold and Tool Co. v. Great Lakes Plastics Inc.*, 75 F.3d 1568, 1573, 37 USPQ2d 1626, 1629-30 (Fed. Cir. 1996); *In re Fine*, 837 F.2d 1071, 1074-76, 5 USPQ2d 1596, 1598-1600 (Fed. Cir. 1988); *In re Dow Chem. Co.*, 837 F.2d 469, 473, 5 USPQ2d 1529, 1531-32 (Fed. Cir. 1988).

We find that, when the claim terms of appealed claim 8[3] are given their broadest reasonable interpretation in light of the written description in the specification as interpreted by one of ordinary skill in this art, *see, e.g., In re Morris*, 127 F.3d 1048, 1054-55, 44 USPQ2d 1023, 1027 (Fed. Cir. 1997); *In re Zletz*, 893 F.2d 319, 321-22, 13 USPQ2d 1320, 1322 (Fed. Cir. 1989), the claim language plainly encompasses a method of forming nickel layers on a plurality of substrates in *any* deposition chamber, of *any* configuration or other function, having *any* heating element of any configuration or power, comprising at least heating the deposition chamber with the heating element prior to and during the step of introducing a first substrate to the chamber, during the step of depositing a layer of nickel on said substrate, during the step of

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[2] Answer, pages 3-5. We note that the admitted prior art is not cited in the statement of the third ground of rejection in the answer or in the final rejection mailed October 30, 2002 (Paper No. 6), even though it is relied on by the examiner in the rejection of appealed claim 14.

[3] Appellants state that the appealed claims "stand or fall together as a group" (brief, page 6) and present arguments based only on appealed claim 8. Thus, we decide this appeal based on appealed claim 8. 37 CFR § 1.192(c)(7) (2003).

removing the first substrate containing the deposited layer from the chamber, during the step of introducing a second substrate and during the step of subsequently depositing a layer of nickel on the second substrate, "wherein the chamber is heated with the heating element continuously between the removal of the first substrate and the introduction of the second substrate."

Appellants submit that "there is nothing in any of the applied prior art references which discloses or suggests any reason to provide . . . continuous heating of the deposition chamber while one substrate is being removed and another is being introduced" (brief, page 8). In this respect, appellants point out that Wolf (page 361) teaches heating the wafer "in a pre-processing chamber . . . to improve step coverage during deposition," and that "this 'may be done in the sputter chamber during deposition'" (brief, page 8; original emphasis deleted); and that "[p]age 2 of the present specification merely teaches preheating the chamber under vacuum for a period of time prior to its use . . . (i.e., bakeout of the chamber)" (brief, page 9). Thus, appellants argue that "[g]vien the disclosure of the references, it would reasonably be presumed that heating of the chamber ceases when the processing of a wafer is complete and the wafer is to be exited from the chamber, and that the heating chamber remains off until a new wafer enters whereupon, the chamber is closed and heating, including preheating, begins anew" (brief, pages 8-9).

The examiner does not dispute appellants' view of the admitted prior art and Wolf, and, generally, of Gupta, Chen and Kunishima (answer, pages 5-6). Indeed, as appellants point out again in the reply brief (page 3), the examiner acknowledges that Gupta "doesn't describe heating the chamber throughout the deposition process" and "doesn't describe a process for the second wafer," and does not point to any teachings in Wolf in these respects (answer, page 4). The examiner merely states, without pointing to any basis in the references, that "it would be obvious to one skilled in the art" to "heat the chamber during deposition to keep process temperature constant for the deposition" and, noting the disclosure to preheat in Wolf, that "it would be obvious to keep the chamber heated in order to heat the second" incoming "wafer and" maintain "the continuity of the whole process" because it "would save processing time of reheating the chamber and it would" increase "product yield" (answer, page 4).

In response to appellants' arguments in the brief, the examiner argues that "it doesn't make any sense" to one of ordinary skill in this art "to preheat the substrate and then" introduce

"it into a cool chamber where the substrate would be cooling down," and because Wolf teaches step coverage heating during deposition (page 361), it would have been obvious to one of ordinary skill in the art to heat the chamber during removal of the first substrate and the introduction of the second substrate so that the substrate does not have to be reheated, noting that more than one substrate can be processed at one time in view of page 2, lines 11-15, of appellants' specification (answer, pages 5-6). The examiner further finds that "it would be common sense" to one of ordinary skill in this art "to keep the chamber heated in order to" maintain "the continuity of the whole process" (answer, page 6). The examiner contends that appellants' contrary presumption that the heating of the chamber ceases with the heating element ceases when the first wafer is removed and is not begun again until the second wafer is placed in the chamber, "is assumptive and without support of evidence" (answer, page 6).

In the reply brief, appellants point out that "the Examiner [has] been unable to identify a specific location in a cited reference which discloses" the requirement for "heating continuously between the removal of the first substrate and the introduction of the second substrate" (pages 3 and 4). Appellants argue that there is no factual basis for the examiner's contentions with respect to what "makes sense" and is "common sense" to one of ordinary skill in this art with respect to the claimed nickel deposition process (reply brief, pages 2-3 and 4-5).

We fail to find in Gupta any teaching with respect to the processing involved with the deposition of nickel on a substrate (see, e.g., col. 2, lines 45-49), but the reference does disclose the formation of a metal silicide by rapid thermal annealing (RTA) and the removal of unreacted nickel which can require heating (col. 3). In the survey text, Wolf discloses that target heating can result from the "natural" sputtering process or from a heating element (e.g., pages 344 and 367), heating with respect to deposition in the pre-processing chamber or during deposition (pages 360-61), and that in some instances, "targets must be adequately cooled to prevent warpage" (page 362). Wolf also discloses "that although it is difficult to measure the exact temperature on the wafer surface during deposition, in practice it is possible to reproduce the same heating from run-to-run" (page 367), as well as a number of sputter system configurations, including the so-called "static" system involving pre-heating and deposition "stations" in what appears to be the same chamber (pages 362-65). Chen discloses heating during such process

steps as silicidation RTA and removal of unreacted metals, including nickel (pages 2437-39). Kunishima discloses a heating apparatus that provides a temperature gradient during the manufacture of semiconductor devices (e.g., cols. 2 and 11), as well as silicidation of a nickel layer on the wafer by RTA and the removal of unreacted metal (cols. 5-6 and 10). Appellants admit in the "background art" section of their specification that the "first wafer effect" was known and, as was "fluctuating chamber hardware conditions results in process inconsistencies," which were overcome in part by a "bakeout" process (page 2).

Based on the evidence of record in the combined teachings of Gupta, the admitted prior art, Wolf, Chen and Kunishima, we agree with appellants that there is no evidence with respect to the use of a heating element in a step or steps subsequent to the steps involved with the deposition of nickel on a single substrate. Thus, on this record, there is no evidence in support of the examiner's presumptions, and indeed, there is also no evidence in support for appellants' presumption, with respect to whether it was known that the heating element is on *or* off in *any* deposition chamber having *any* heating element, when a first treated substrate is removed from the chamber and a second substrate is introduced into the chamber, as required by appealed claim 8.

The difference in the positions taken is, of course, that the examiner has the burden to establish a *prima facie* case of obviousness based on substantial evidence in the record in order to reject a claim under § 103(a). *See, e.g., In re Oetiker*, 977 F.2d 1443, 1445, 24 USPQ2d 1443, 1444 (Fed. Cir. 1992). Mere reliance on "common sense" where such basis is not established by objective evidence and/or scientific reasoning, does not establish a *prima facie* case of obviousness. *See generally, In re Rouffet, supra* ("hindsight" is inferred when the specific understanding or principal within the knowledge of one of ordinary skill in the art leading to the modification of the prior art in order to arrive at appellant's claimed invention has not been explained); *Dow Chem.*, 837 F.2d at 473, 5 USPQ2d at 1531 ("The consistent criterion for determination of obviousness is whether the prior art would have suggested to one of ordinary skill in the art that [the claimed process] should be carried out and would have a reasonable likelihood of success viewed in light of the prior art. [Citations omitted] Both the suggestion and the expectation of success must be founded in the prior art, not in the applicant's disclosure.").

Accordingly, because the basic factual foundation for each ground of rejection is the same, we reverse all of the grounds of rejection in view of the absence of a p*rima facie* case of obviousness within the meaning of 35 U.S.C. § 103(a)

The examiner's decision is reversed.

Reversed

CHARLES F. WARREN)
Administrative Patent Judge)
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